

Conformal Carbon Nanotubes for Stray Light Suppression

Completed Technology Project (2012 - 2014)



Project Introduction

We have developed ultra-black CVD (chemical vapor deposition) and embedded carbon nanotube surface treatments for use in the near UV to far infrared for stray light suppression, near-ideal radiators and calibrators and detector absorbers. We propose to develop techniques using atomic layer deposition (ALD) and electric field alignment to apply nanotubes to non-flat substrates to broaden their utilization to many additional components for space flight use.

Our objective is to apply CVD and non-CVD carbon nanotubes to complex shapes that numerous scientists have requested for stray light control. Currently, CVD nanotubes can only be grown on flat surfaces due to limitations in line-of-sight physical vapor deposition techniques such as e-beam evaporation. For CVD our adhesion and catalyst layers must be applied on the on the component with extreme uniformity to a thickness of 1 to 2 nm for ideal performance. Then the component must be placed in the thermal reactor furnace flow in a way that allows uniform exposure to the carbon bearing gas. Our first focus area is to utilize atomic layer deposition (ALD) to apply our adhesion and catalyst layers conforming to the desired substrate surface. This will allow fabrication of components that are dark on all surfaces instead of just on one surface.

Anticipated Benefits

This technology is applicable to all NASA missions and optical instruments operating from the UV to far Infrared. A 6dB improvement in signal to noise has been observed on the Formaldehyde Laser Florescence experiment that has flown on a NASA aircraft for the past year.



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Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
★ Goddard Space Flight Center (GSFC)	Lead Organization	NASA Center	Greenbelt, Maryland

Primary U.S. Work Locations

Maryland

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Goddard Space Flight Center (GSFC)

Responsible Program:

Center Innovation Fund: GSFC CIF

Project Management

Program Director:

Michael R Lapointe

Program Manager:

Peter M Hughes

Project Manager:

Terence A Doiron

Principal Investigator:

John G Hagopian

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Images



Conformal Carbon Nanotubes for Stray Light Suppression Project

Conformal Carbon Nanotubes for Stray Light Suppression Project
(<https://techport.nasa.gov/image/5055>)

Links

NTR 1
(no url provided)

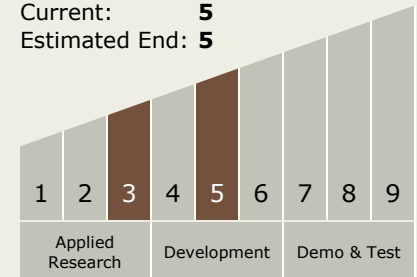
NTR 1
(<http://GSC-16708-19/11/2012>)

Project Website:

<http://aetd.gsfc.nasa.gov/>

Technology Maturity (TRL)

Start: 3
Current: 5
Estimated End: 5



Technology Areas

Primary:

- TX12 Materials, Structures, Mechanical Systems, and Manufacturing
 - TX12.1 Materials
 - TX12.1.5 Coatings